Import Libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

Reading and Cleaning Data

In [2]:
```
df = pd.read_csv('OCD Patient Dataset_ Demographics & Clinical Data.csv')
```

In [3]:
```
print('Dataset dimension: ', df.shape)
```

```
Dataset dimension:  (1500, 17)
```

In [4]:
```
print('Attributes in the dataset: ', df.columns)
```

```
Attributes in the dataset:  Index(['Patient ID', 'Age', 'Gender', 'Ethnicity',
'Marital Status',
       'Education Level', 'OCD Diagnosis Date',
       'Duration of Symptoms (months)', 'Previous Diagnoses',
       'Family History of OCD', 'Obsession Type', 'Compulsion Type',
       'Y-BOCS Score (Obsessions)', 'Y-BOCS Score (Compulsions)',
       'Depression Diagnosis', 'Anxiety Diagnosis', 'Medications'],
      dtype='object')
```

In [5]:
```
df.head()
```

Out[5]:

	Patient ID	Age	Gender	Ethnicity	Marital Status	Education Level	OCD Diagnosis Date	Duration of Symptoms (months)
0	1018	32	Female	African	Single	Some College	2016-07-15	203
1	2406	69	Male	African	Divorced	Some College	2017-04-28	180
2	1188	57	Male	Hispanic	Divorced	College Degree	2018-02-02	173
3	6200	27	Female	Hispanic	Married	College Degree	2014-08-25	126
4	5824	56	Female	Hispanic	Married	High School	2022-02-20	168

Attributes Description:

1. Patient ID - Unique identifier for each individual in the dataset.

2. Age - Age of the patient at the time of data collection.
3. Gender - Gender of the patient
4. Ethnicity - Ethnic background of the patient
5. Marital Status - Marital status of the patient
6. Education Level - Highest level of education completed by the patient.
7. OCD Diagnosis Date - Date when the patient was diagnosed with Obsessive-Compulsive Disorder.
8. Duration of Symptoms (months) - Number of months since the onset of OCD symptoms.
9. Previous Diagnoses - Any previous psychiatric diagnoses or comorbidities.
10. Family History of OCD - Indicates whether there is a family history of OCD in the patient's relatives.
11. Obsession Type - 'Harm-related', 'Contamination', 'Symmetry', 'Hoarding', 'Religious'
12. Compulsion Type - 'Checking', 'Washing', 'Ordering', 'Praying', 'Counting'
13. Y-BOCS Score (Obsessions) - Yale-Brown Obsessive Compulsive Scale for assessing the severity of OCD symptoms
14. Y-BOCS Score (Compulsions) - the other primary subscale of the Yale-Brown Obsessive Compulsive Scale (Y-BOCS). This part focuses on assessing the severity of compulsions.
15. Depression Diagnosis - Diagnosis of depression (Yes or No)
16. Anxiety Diagnosis - Diagnosis of anxiety (Yes or No)
17. Medications - Type of medications use

Checking Missing Values

In [6]:
```
df.isnull().sum()
```

Out[6]:

	0
Patient ID	0
Age	0
Gender	0
Ethnicity	0
Marital Status	0
Education Level	0
OCD Diagnosis Date	0
Duration of Symptoms (months)	0
Previous Diagnoses	248
Family History of OCD	0
Obsession Type	0
Compulsion Type	0
Y-BOCS Score (Obsessions)	0
Y-BOCS Score (Compulsions)	0
Depression Diagnosis	0
Anxiety Diagnosis	0
Medications	386

dtype: int64

There are 248 missing values in Previous Diagnoses column and 386 missing values in Medications column.

In [7]:
```
df.info()
```

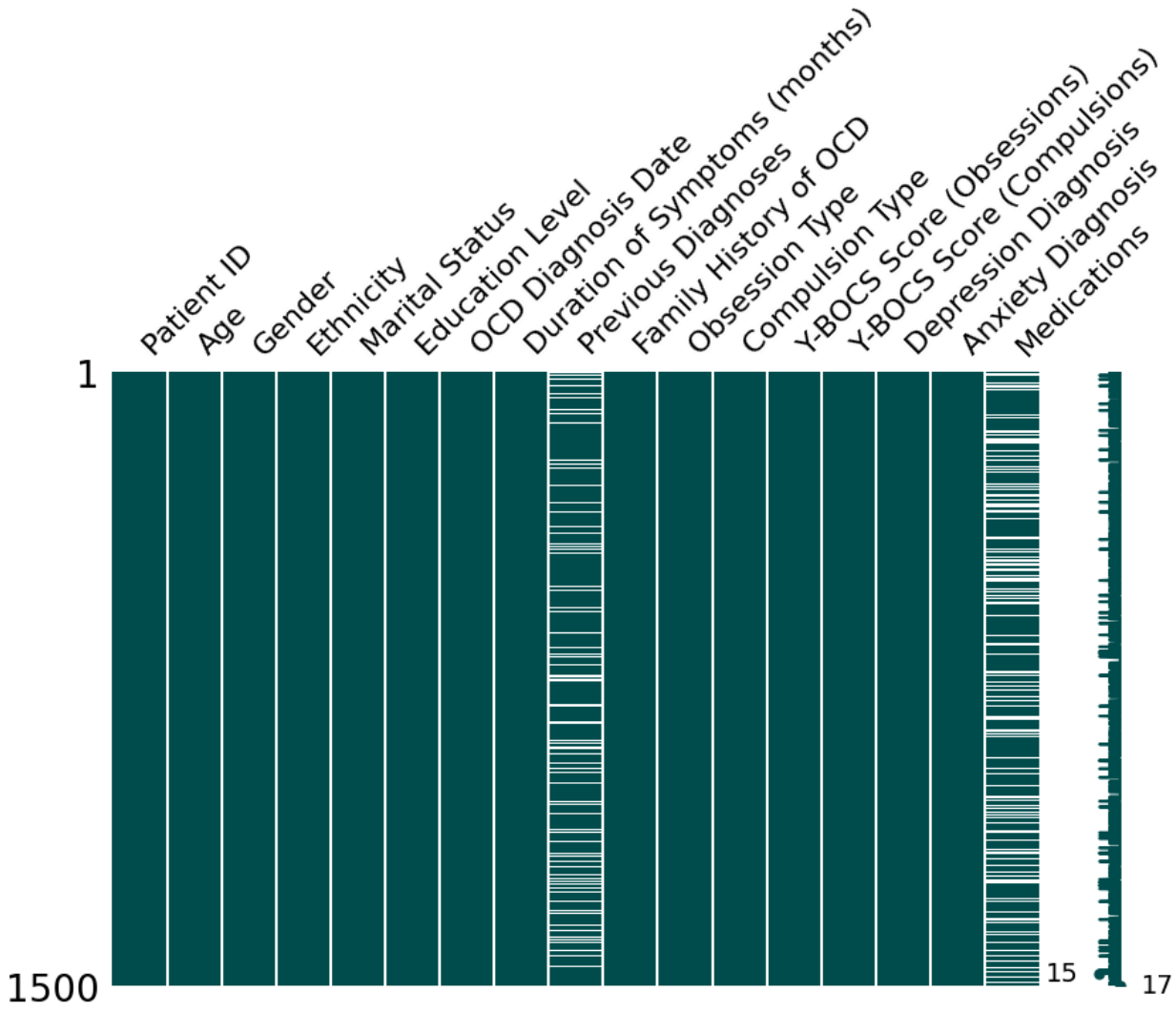
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1500 entries, 0 to 1499
Data columns (total 17 columns):
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   Patient ID                      1500 non-null   int64
 1   Age                             1500 non-null   int64
 2   Gender                          1500 non-null   object
 3   Ethnicity                       1500 non-null   object
 4   Marital Status                  1500 non-null   object
 5   Education Level                 1500 non-null   object
 6   OCD Diagnosis Date              1500 non-null   object
 7   Duration of Symptoms (months)   1500 non-null   int64
 8   Previous Diagnoses              1252 non-null   object
 9   Family History of OCD           1500 non-null   object
 10  Obsession Type                  1500 non-null   object
 11  Compulsion Type                 1500 non-null   object
 12  Y-BOCS Score (Obsessions)       1500 non-null   int64
 13  Y-BOCS Score (Compulsions)      1500 non-null   int64
 14  Depression Diagnosis            1500 non-null   object
 15  Anxiety Diagnosis               1500 non-null   object
 16  Medications                     1114 non-null   object
dtypes: int64(5), object(12)
memory usage: 199.3+ KB
```

Among the 17 feature columns, 5 contain numerical values, while the remaining columns are categorical.

In [8]:
```
import missingno as msno
plt.gcf().set_facecolor('white')
msno.matrix(df, figsize=(10,6), color=(0,.3,.3))
```

Out[8]:
```
<Axes: >
```

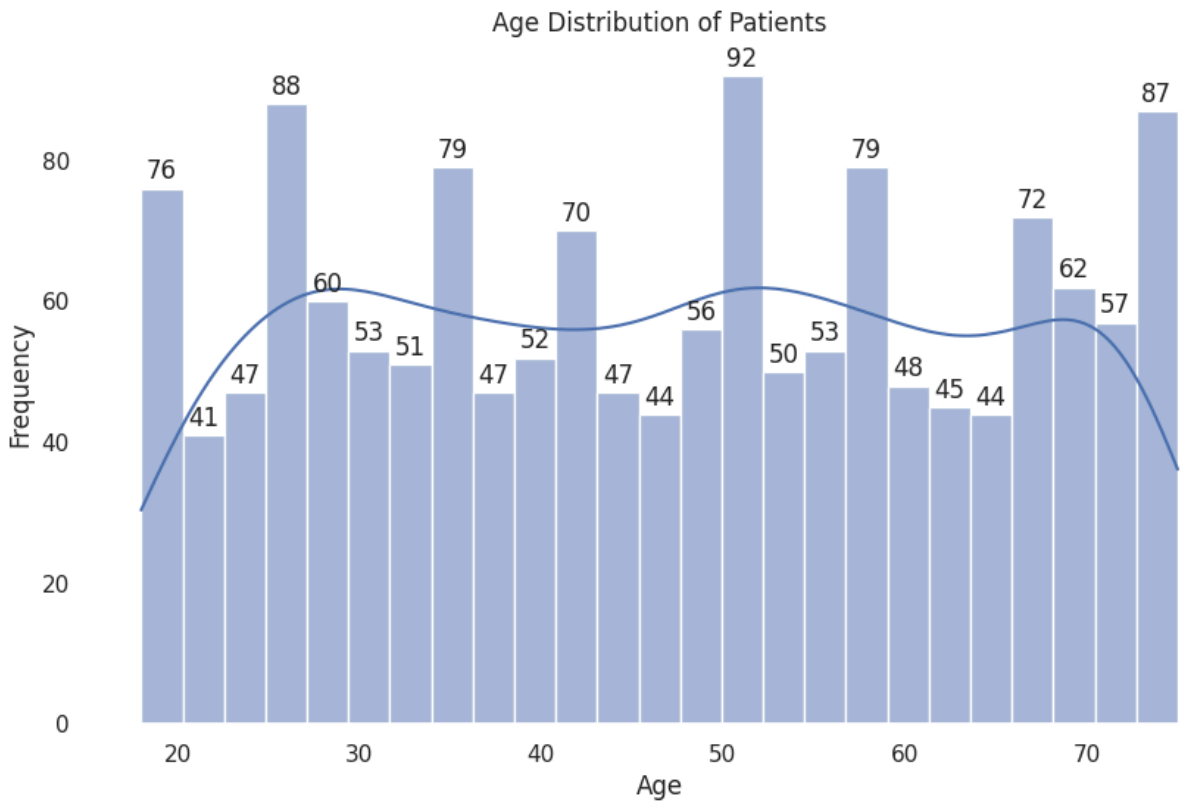
```
<Figure size 640x480 with 0 Axes>
```



Visualizing Demographic Data

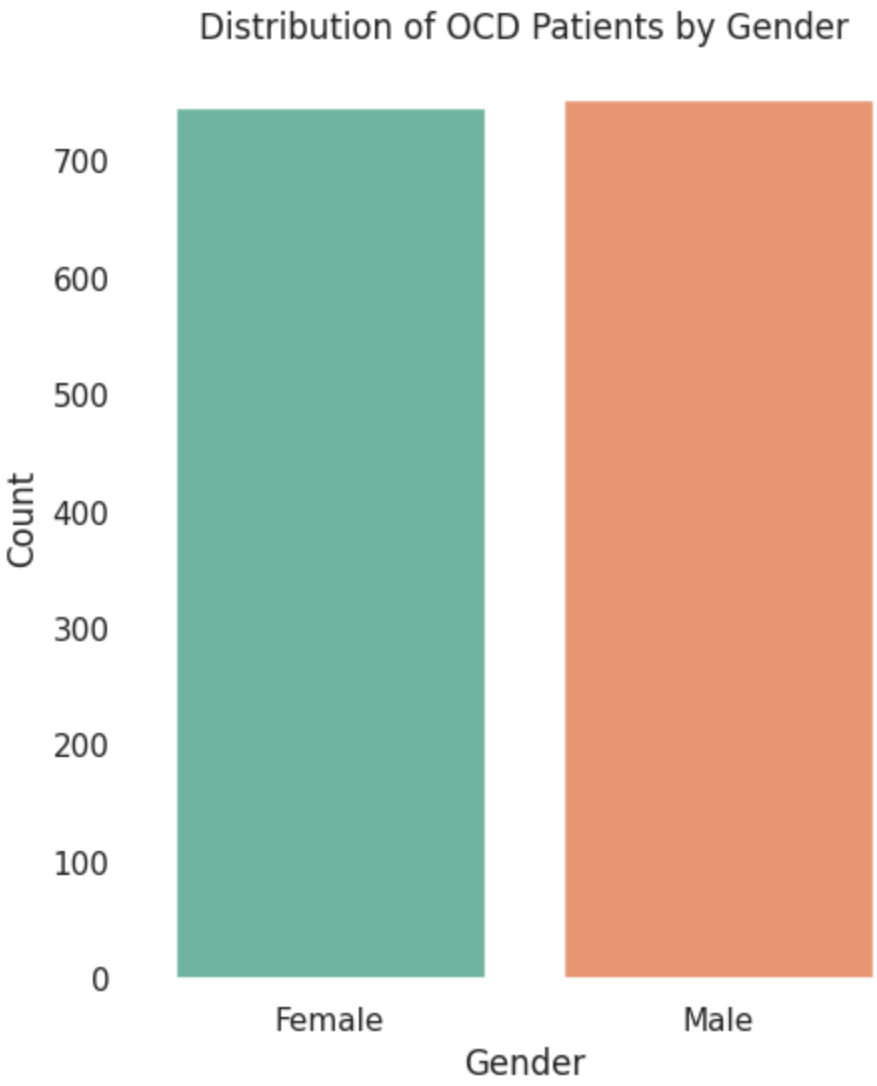
In [43]:

```
# Age distribution
plt.figure(figsize=(10, 6))
ax = sns.histplot(df['Age'], bins=25, kde=True)
plt.title('Age Distribution of Patients')
plt.xlabel('Age')
plt.ylabel('Frequency')
# Add values on top of bars
for p in ax.patches:
    height = p.get_height()
    if np.isnan(height) or height == 0:  # Skip empty bins
        continue
    ax.text(p.get_x() + p.get_width() / 2., height + 0.5,  # Adjust position a
            '{:1.0f}'.format(height), ha="center", va="bottom")
plt.show()
```

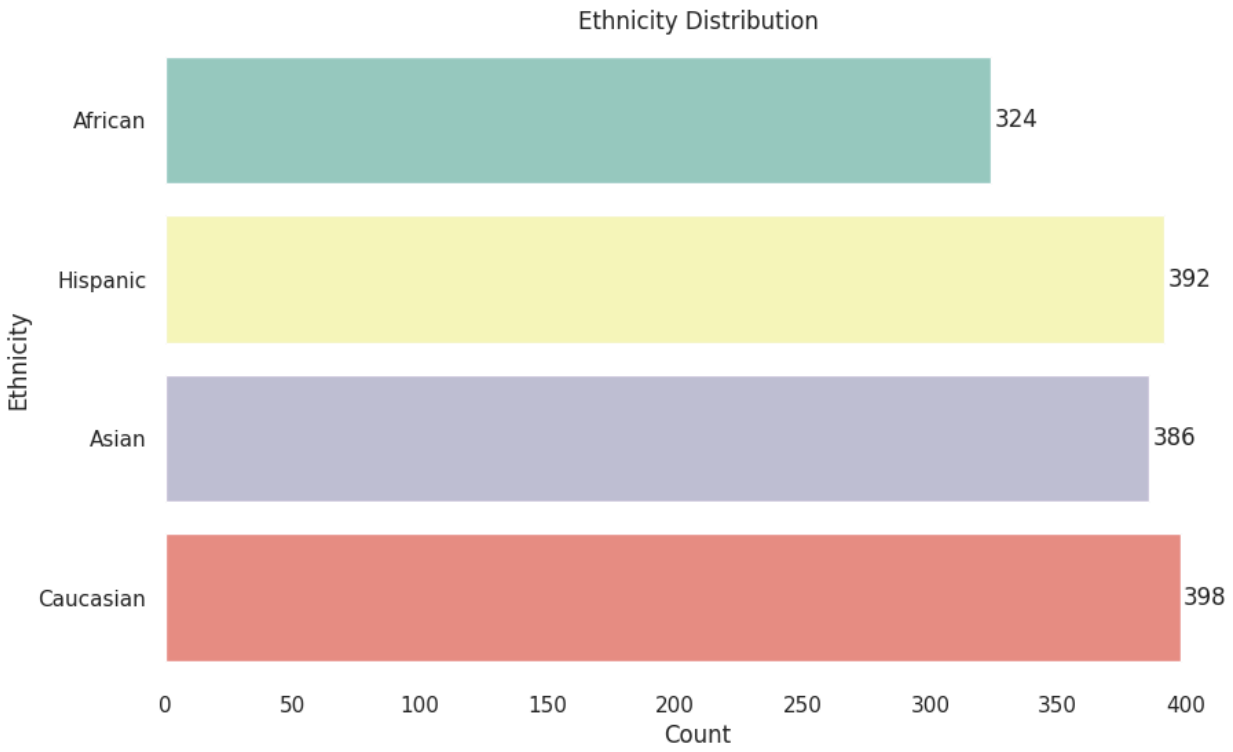


In [29]:
```python
# Count the occurrences of each gender
gender_counts = df['Gender'].value_counts()

# Print the results
print("Number of Female Patients:", gender_counts.get('Female', 0))
print("Number of Male Patients:", gender_counts.get('Male', 0))

# Create a bar graph using seaborn
plt.figure(figsize=(5, 6))  # Adjust figure size as needed
sns.countplot(x='Gender', data=df, palette='Set2')  # Use countplot for easier
plt.title('Distribution of OCD Patients by Gender')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.show()
```

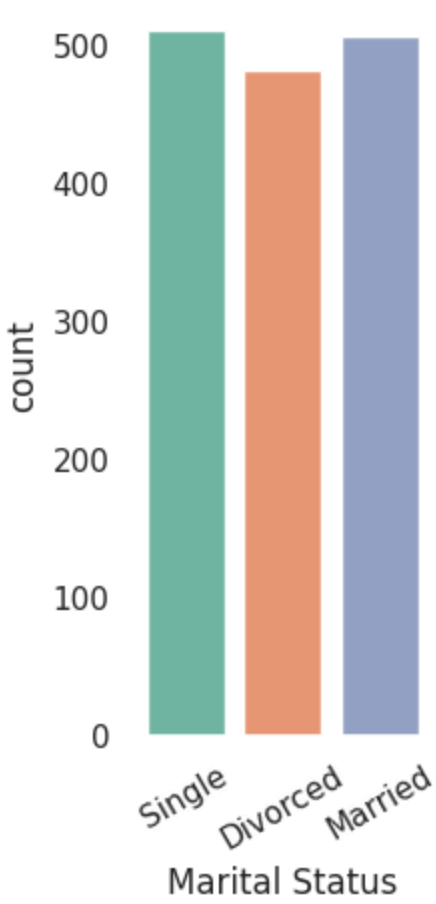
```
Number of Female Patients: 747
Number of Male Patients: 753
```

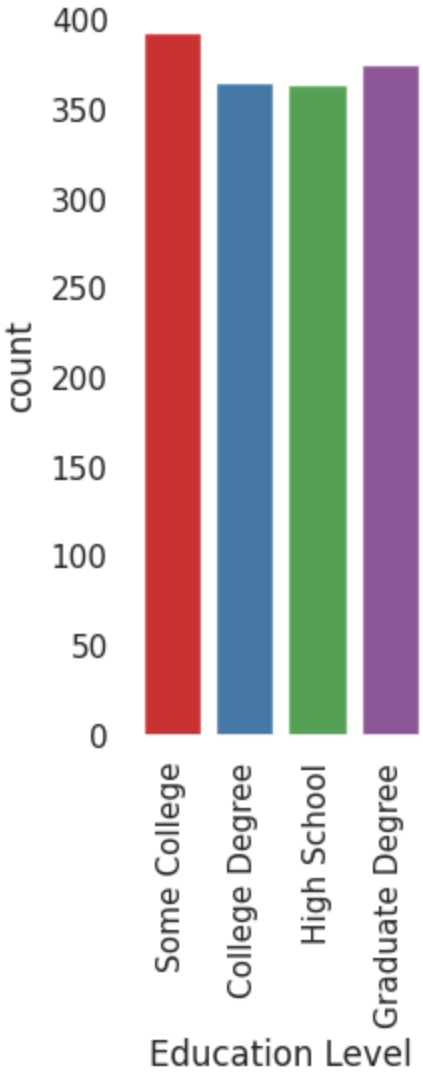


In [32]:
```
# Ethnicity distribution with values on bars
plt.figure(figsize=(10, 6))
ax = sns.countplot(y='Ethnicity', data=df, palette='Set3')
plt.title('Ethnicity Distribution')
plt.xlabel('Count')
plt.ylabel('Ethnicity')

# Add values on top of bars
for p in ax.patches:
    width = p.get_width()
    plt.text(width + 1, p.get_y() + p.get_height() / 2,
             '{:1.0f}'.format(width), ha="left", va="center")

plt.show()
```

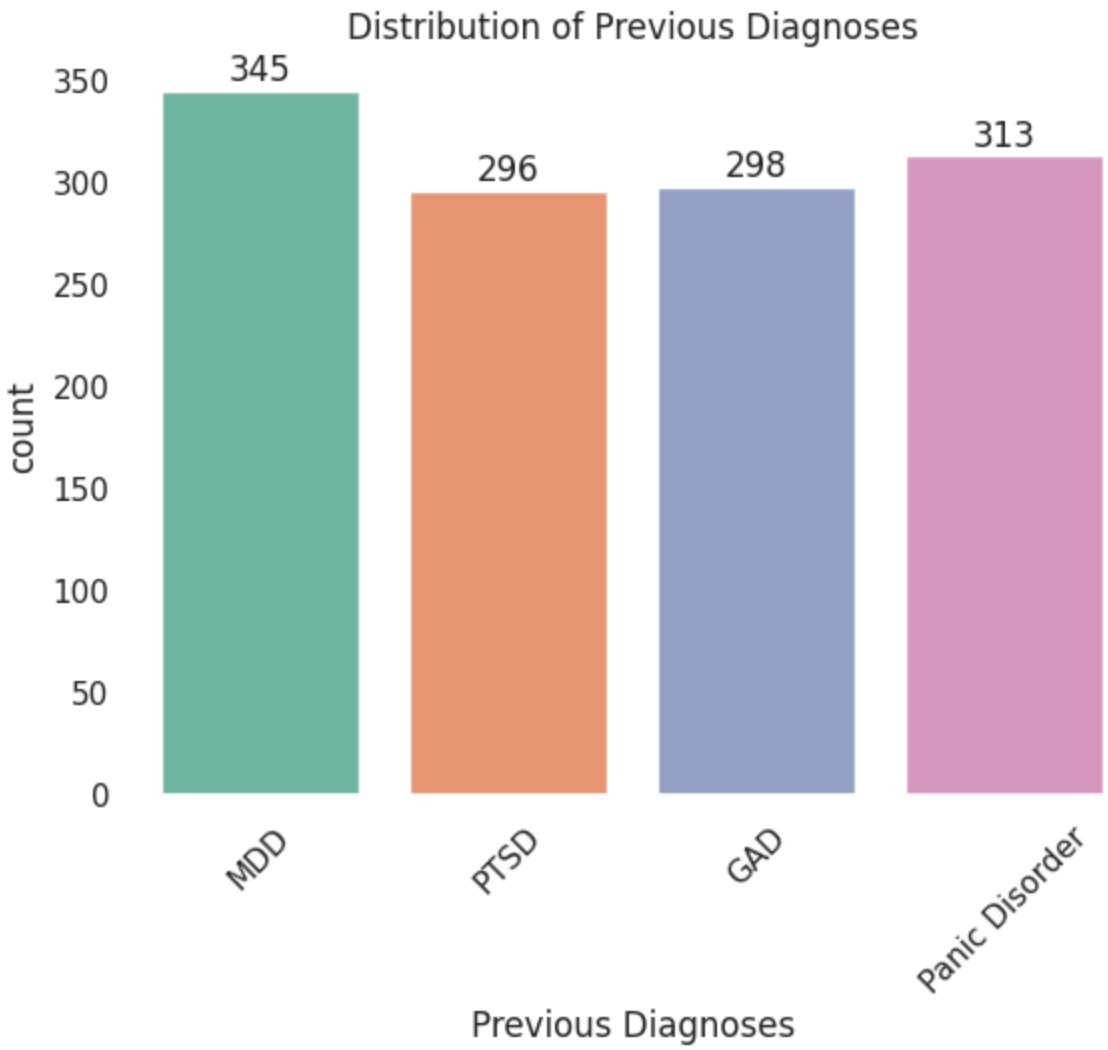


In [71]:
```
plt.subplot(1, 3, 1)
sns.countplot(x = df["Marital Status"], palette="Set2")
plt.xticks(rotation = 30);
plt.subplot(1, 3, 3)
sns.countplot(x = df["Education Level"], palette="Set1")
plt.xticks(rotation = 90);
```

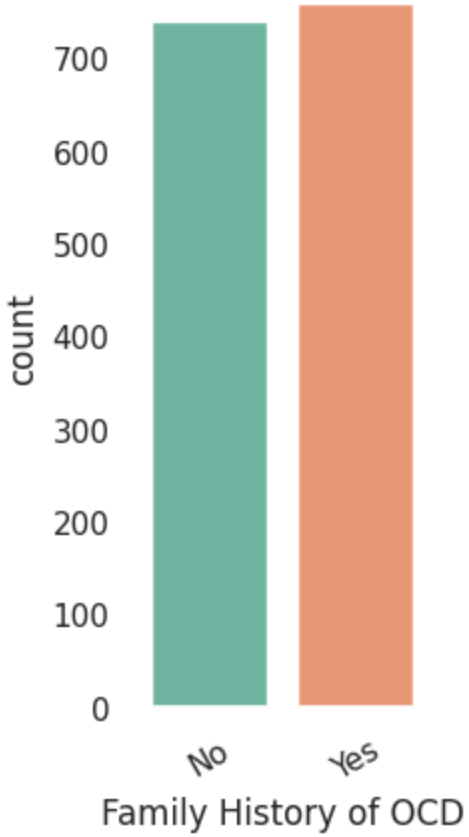


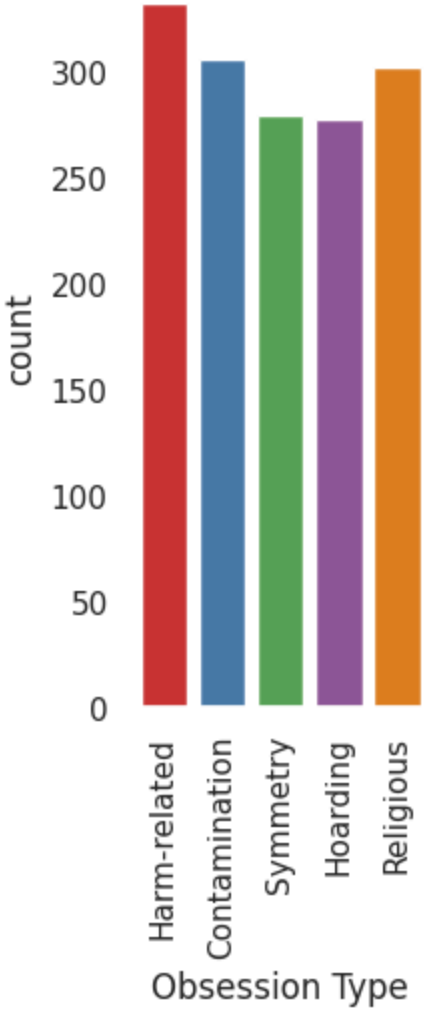


In [55]:
```
plt.plot(1, 3, 1)
ax = sns.countplot(x = df["Previous Diagnoses"], palette="Set2")
plt.title('Distribution of Previous Diagnoses')
# Add values on top of bars
for p in ax.patches:
    height = p.get_height()
    if np.isnan(height) or height == 0:  # Skip empty bins
        continue
    ax.text(p.get_x() + p.get_width() / 2., height + 0.5,  # Adjust position a
            '{:1.0f}'.format(height), ha="center", va="bottom")
plt.xticks(rotation = 45);
```

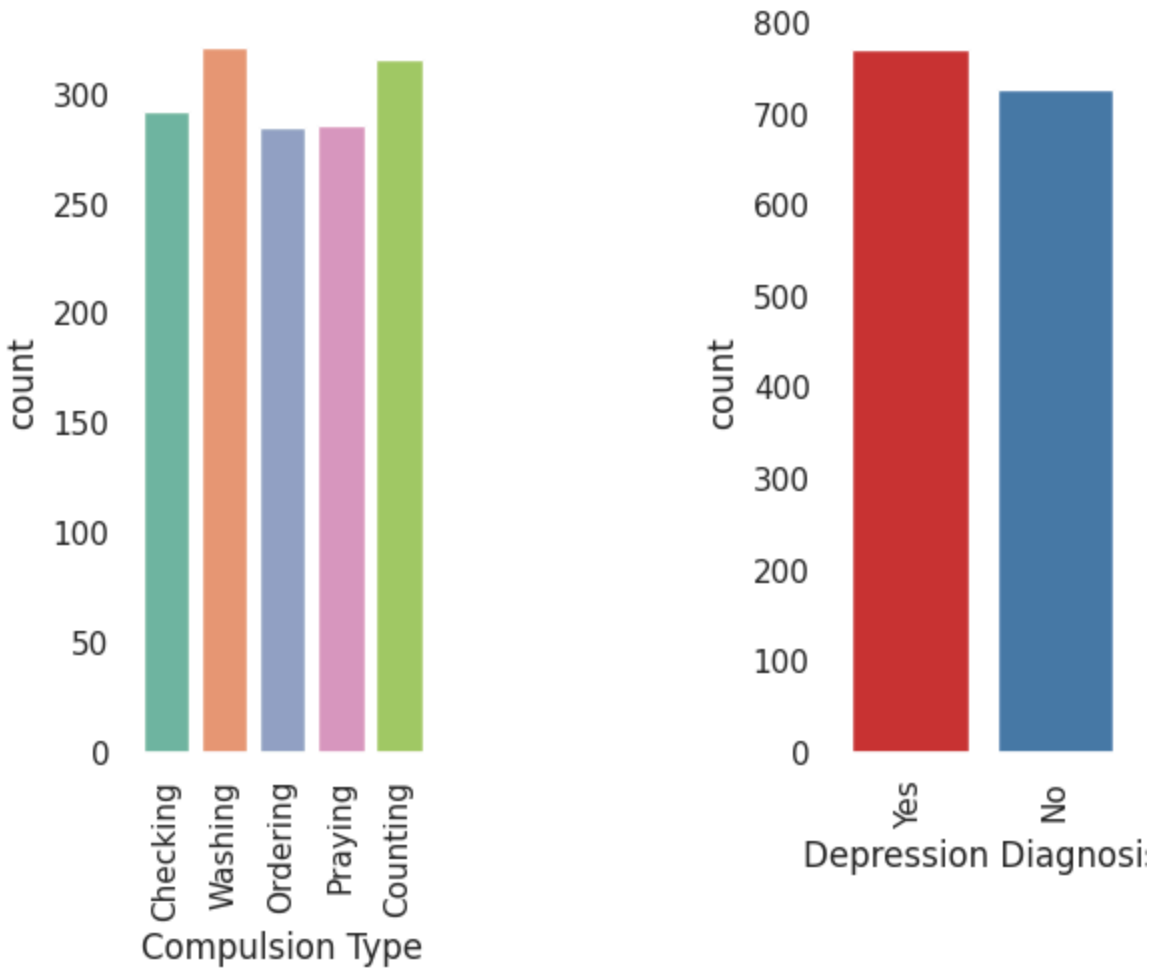


In [80]:
```
plt.subplot(1, 3, 1)
sns.countplot(x = df["Family History of OCD"], palette="Set2")
plt.xticks(rotation = 30);
plt.subplot(1, 3, 3)
sns.countplot(x = df["Obsession Type"], palette="Set1")
plt.xticks(rotation = 90);
```

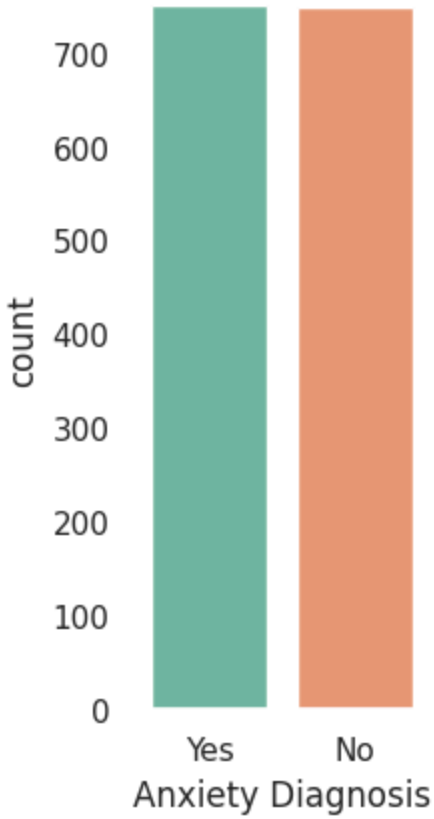


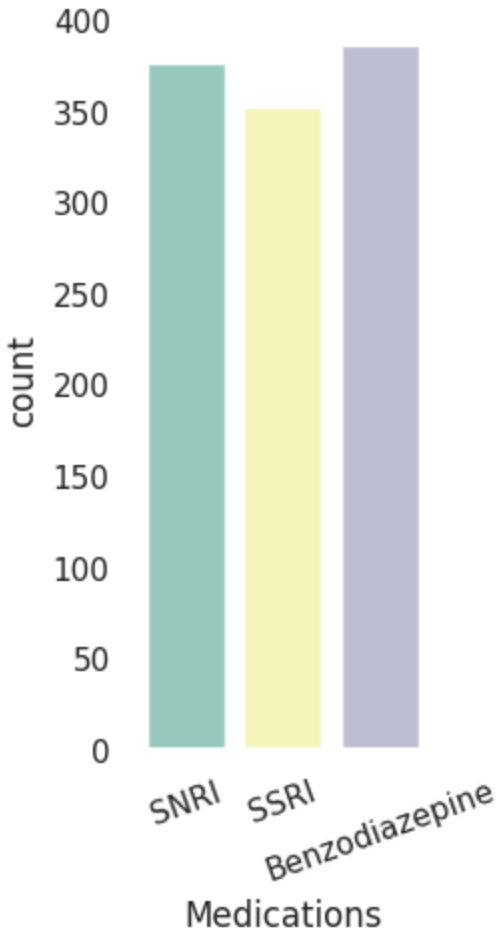


In [77]:
```
plt.subplot(1, 3, 1)
sns.countplot(x = df["Compulsion Type"], palette="Set2")
plt.xticks(rotation = 90);
plt.subplot(1, 3, 3)
sns.countplot(x = df["Depression Diagnosis"], palette="Set1")
plt.xticks(rotation = 90);
```



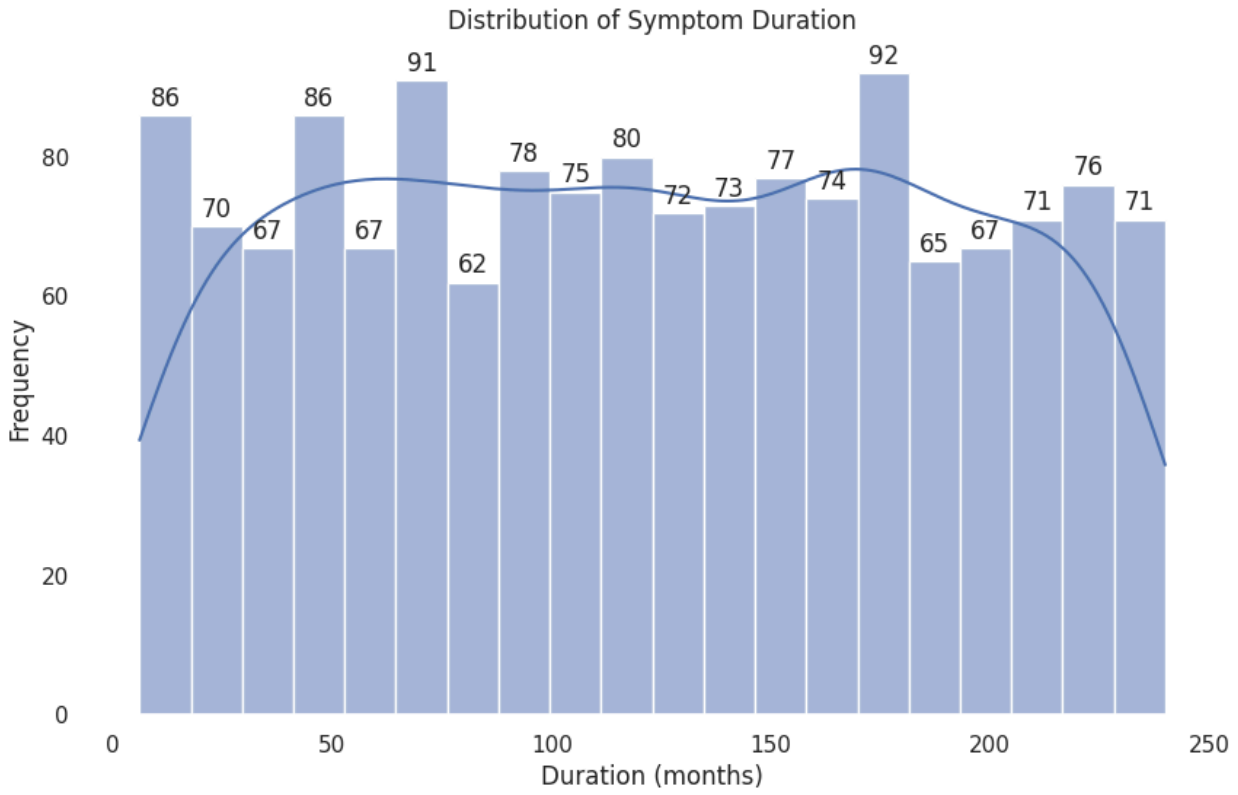
In [76]:
```
plt.subplot(1, 3, 1)
sns.countplot(x = df["Anxiety Diagnosis"], palette="Set2")
plt.xticks(rotation = 0);
plt.subplot(1, 3, 3)
sns.countplot(x = df["Medications"], palette="Set3")
plt.xticks(rotation = 20);
```



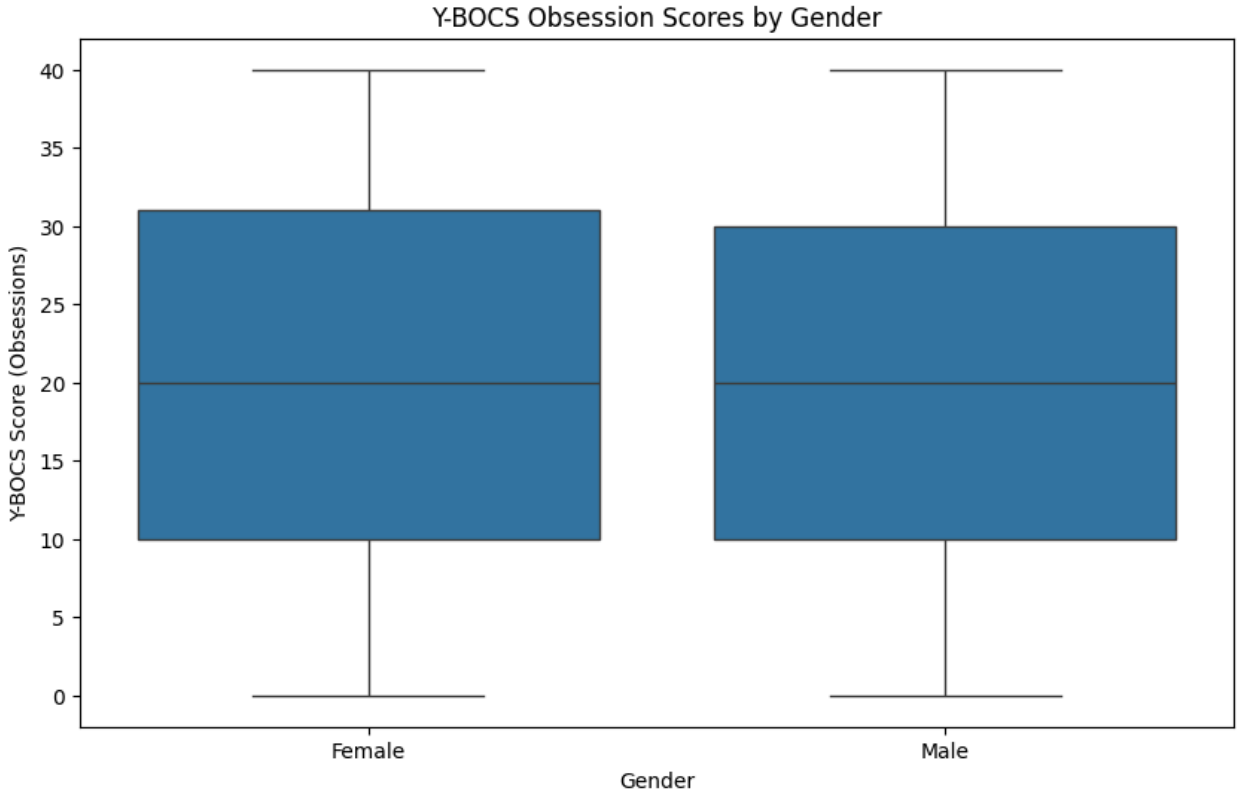


Clinical Data Analysis

In [40]:
```
# Distribution of symptom duration with values on bars
plt.figure(figsize=(10, 6))
ax = sns.histplot(df['Duration of Symptoms (months)'], bins=20, kde=True)
plt.title('Distribution of Symptom Duration')
plt.xlabel('Duration (months)')
plt.ylabel('Frequency')

# Add values on top of bars
for p in ax.patches:
    height = p.get_height()
    if np.isnan(height) or height == 0:  # Skip empty bins
        continue
    ax.text(p.get_x() + p.get_width() / 2., height + 0.5,  # Adjust position a
            '{:1.0f}'.format(height), ha="center", va="bottom")

plt.show()
```

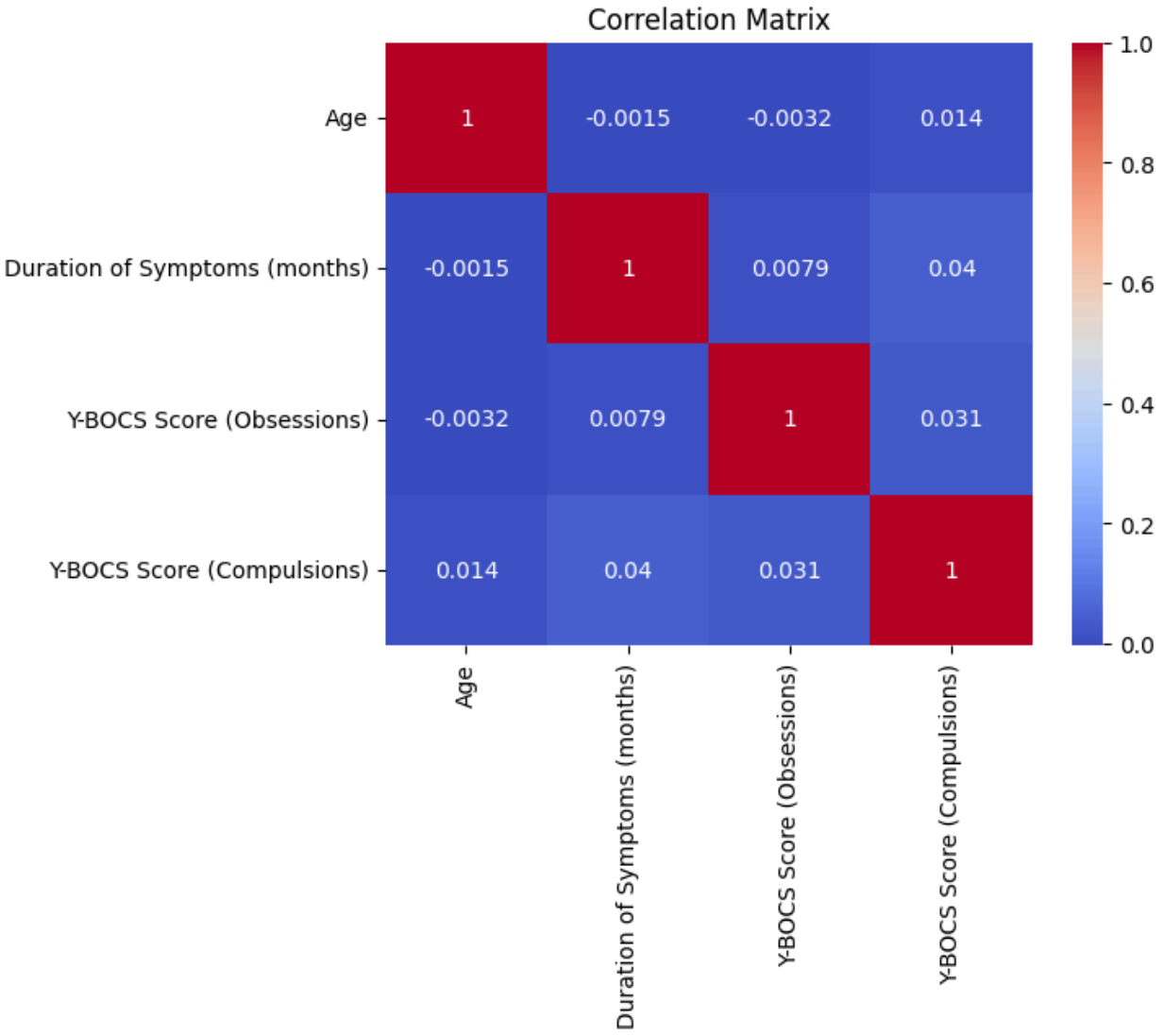


In [13]:
```python
# Boxplot of Y-BOCS Scores by Gender
plt.figure(figsize=(10, 6))
sns.boxplot(x='Gender', y='Y-BOCS Score (Obsessions)', data=df)
plt.title('Y-BOCS Obsession Scores by Gender')
plt.xlabel('Gender')
plt.ylabel('Y-BOCS Score (Obsessions)')
plt.show()
```

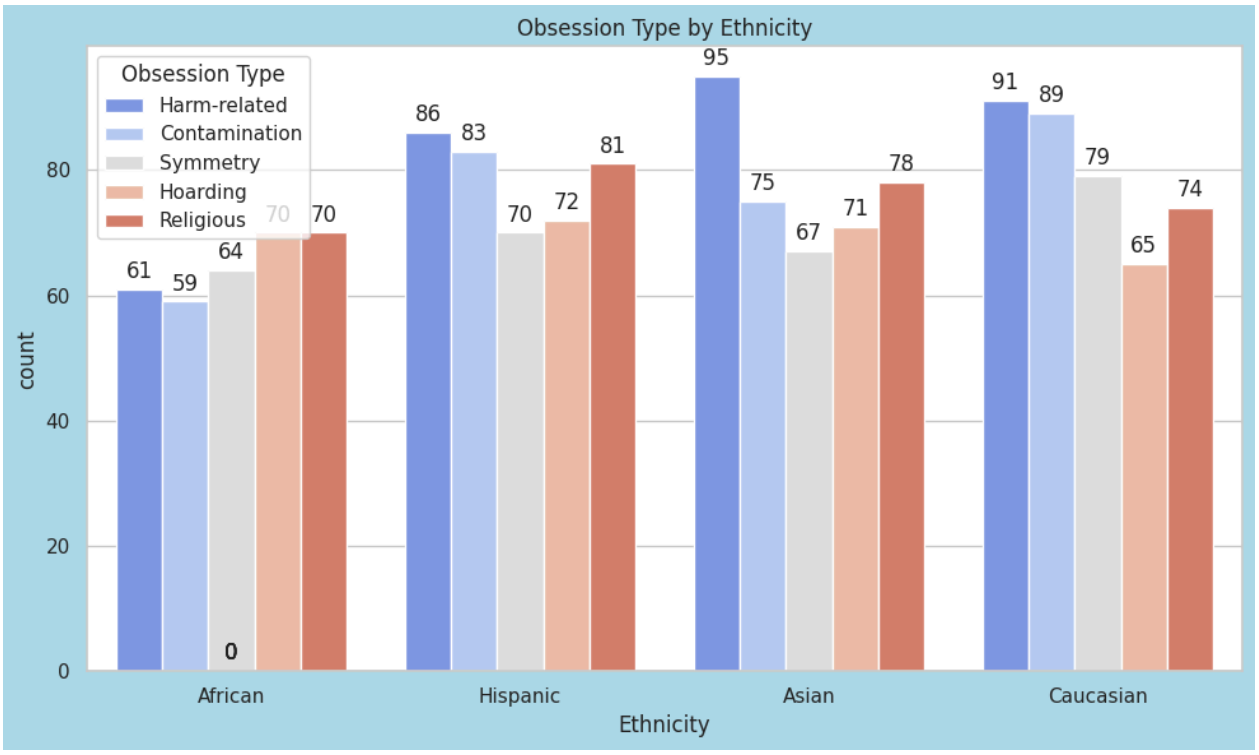


Correlation Analysis

In [21]:
```
corr_matrix = df[['Age', 'Duration of Symptoms (months)', 'Y-BOCS Score (Obses
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Matrix')
plt.show()
```



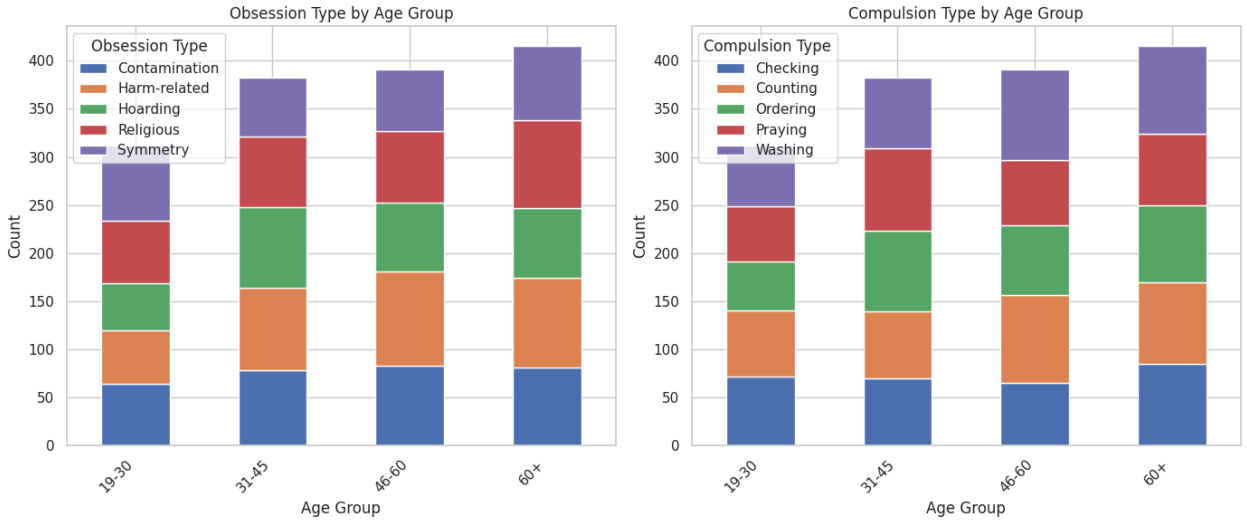
In [23]:
```
# Set the background color
sns.set(rc={'axes.facecolor':'lightblue', 'figure.facecolor':'lightblue'})

# Create the bar plot
plt.figure(figsize=(10, 6))
sns.set(style="whitegrid")
plot = sns.countplot(data=df, x='Ethnicity', hue='Obsession Type', palette='cc
# Add a title
plt.title('Obsession Type by Ethnicity')
# Add data labels
for p in plot.patches:
    plot.annotate(format(p.get_height(), '.0f'),
                  (p.get_x() + p.get_width() / 2., p.get_height()),
                  ha = 'center', va = 'center',
                  xytext = (0, 10),
                  textcoords = 'offset points')
plt.tight_layout()  # Adjust layout to prevent labels from overlapping
plt.show()
```



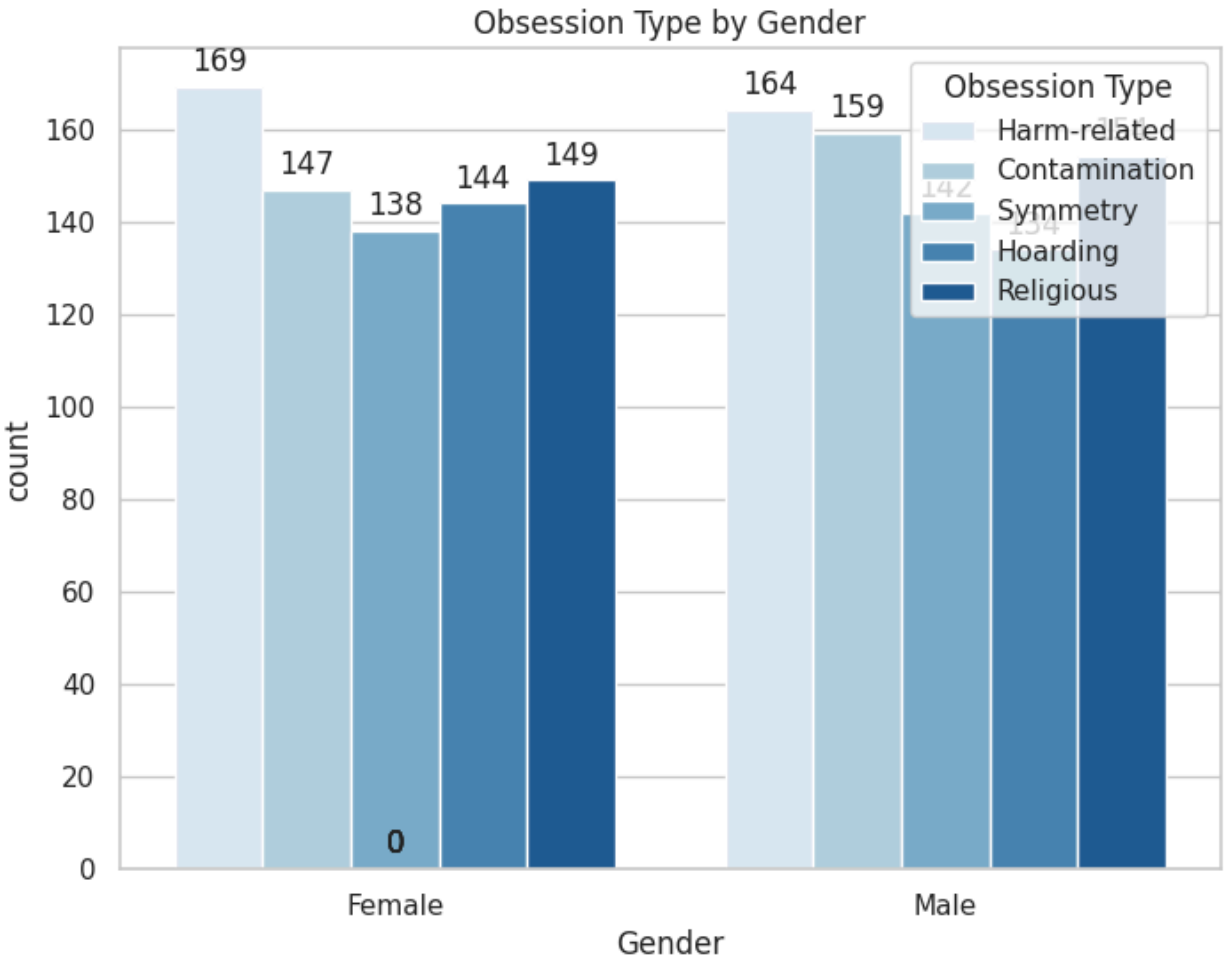
In [24]:

```
# Define age group bins and labels
bins = [0, 18, 30, 45, 60, 100]
labels = ['0-18', '19-30', '31-45', '46-60', '60+']

# Create a new column 'AgeGroup' using pd.cut
df['AgeGroup'] = pd.cut(df['Age'], bins=bins, labels=labels, right=False)

# Create a cross-tabulation table
obsession_counts = pd.crosstab(df['AgeGroup'], df['Obsession Type'])
compulsion_counts = pd.crosstab(df['AgeGroup'], df['Compulsion Type'])

# Create subplots for Obsession and Compulsion Types
fig, axes = plt.subplots(1, 2, figsize=(14, 6))

# Set the background color for the entire figure
sns.set(rc={'axes.facecolor':'white', 'figure.facecolor':'white'})

# Plot for Obsession Type
obsession_counts.plot(kind='bar', stacked=True, ax=axes[0])
axes[0].set_title('Obsession Type by Age Group')
axes[0].set_xlabel('Age Group')
axes[0].set_ylabel('Count')

# Plot for Compulsion Type
compulsion_counts.plot(kind='bar', stacked=True, ax=axes[1])
axes[1].set_title('Compulsion Type by Age Group')
axes[1].set_xlabel('Age Group')
axes[1].set_ylabel('Count')

# Rotate x-axis labels and adjust layout
plt.setp(axes, xticks=axes[0].get_xticks(), xticklabels=axes[0].get_xticklabel
```

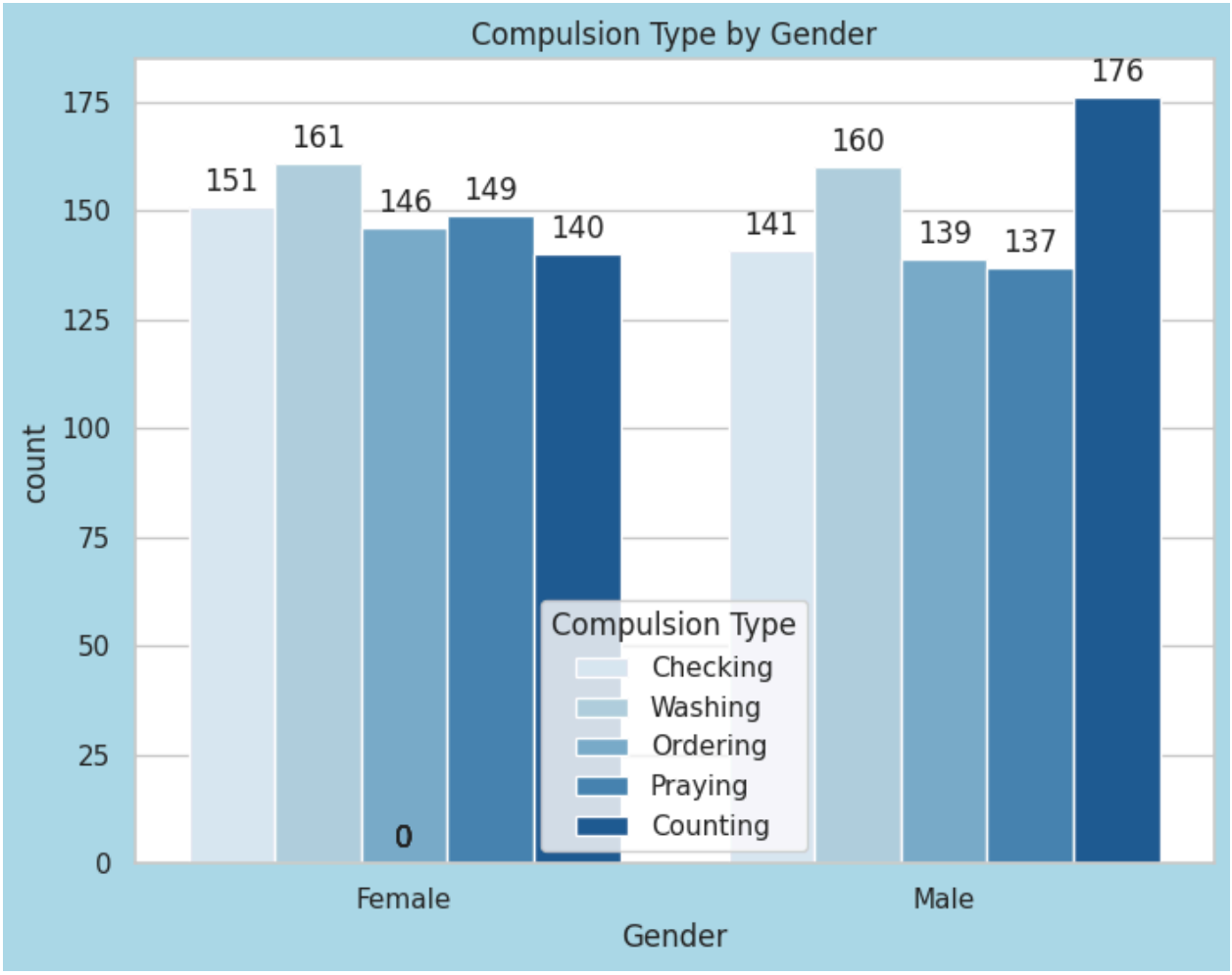
```
plt.setp(axes[0].get_xticklabels(), rotation=45, ha='right')
plt.setp(axes[1].get_xticklabels(), rotation=45, ha='right')
plt.tight_layout()

# Show the plot
plt.show()
```



In [25]:
```
# Create the bar plot
plt.figure(figsize=(8, 6))
sns.set(style="whitegrid")

# Create the count plot with specified palette
plot = sns.countplot(data=df, x='Gender', hue='Obsession Type', palette='Blues

# Set the background color
sns.set(rc={'axes.facecolor':'lightblue', 'figure.facecolor':'lightblue'})
#Add a title by
plt.title('Obsession Type by Gender')
# Add data labels
for p in plot.patches:
    plot.annotate(format(p.get_height(), '.0f'),
                  (p.get_x() + p.get_width() / 2., p.get_height()),
                  ha = 'center', va = 'center',
                  xytext = (0, 10),
                  textcoords = 'offset points')

# Show the plot
plt.show()
```

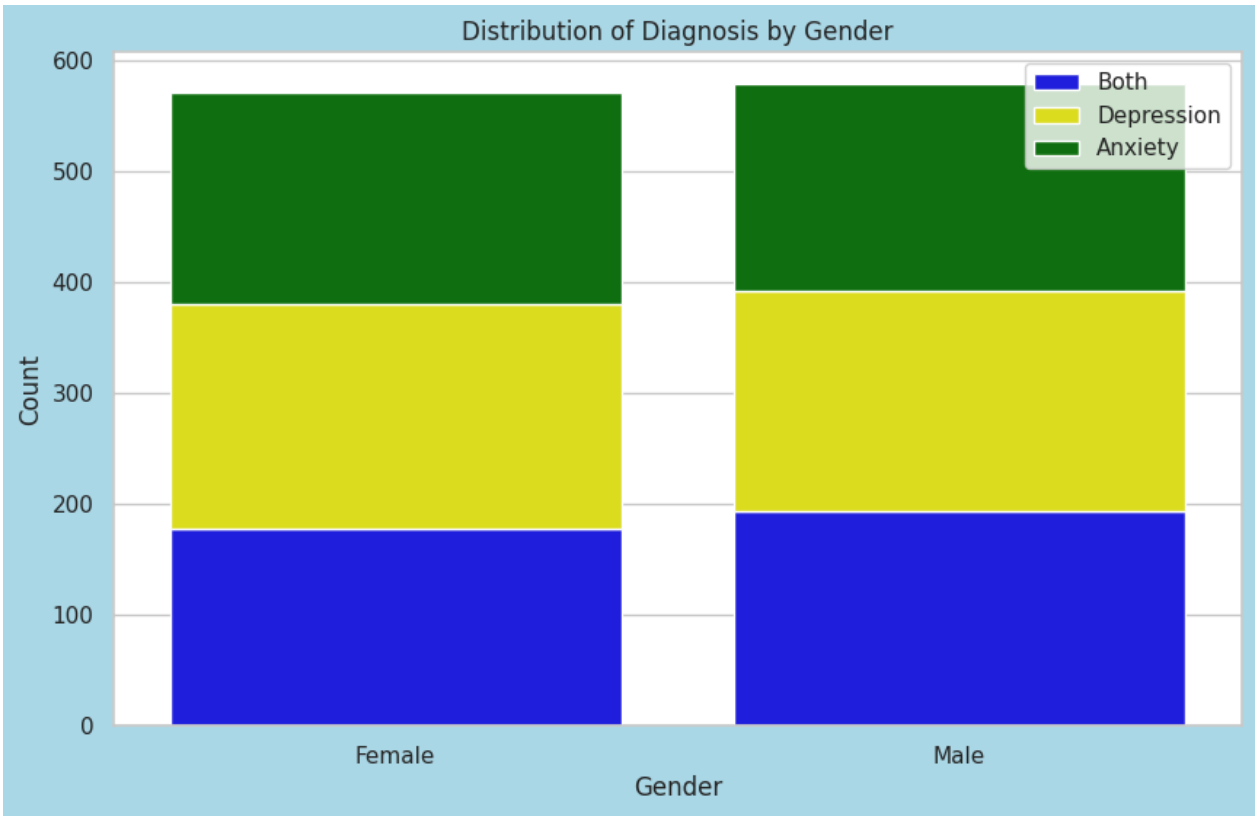


In [73]:
```
# Create the bar plot
plt.figure(figsize=(8, 6))
sns.set(style="whitegrid")

# Create the count plot with specified palette
plot = sns.countplot(data=df, x='Gender', hue='Compulsion Type', palette='Blue

# Set the background color
sns.set(rc={'axes.facecolor':'lightblue', 'figure.facecolor':'lightblue'})
#Add a title by
plt.title('Compulsion Type by Gender')
# Add data labels
for p in plot.patches:
    plot.annotate(format(p.get_height(), '.0f'),
                  (p.get_x() + p.get_width() / 2., p.get_height()),
                  ha = 'center', va = 'center',
                  xytext = (0, 10),
                  textcoords = 'offset points')

# Show the plot
plt.show()
```

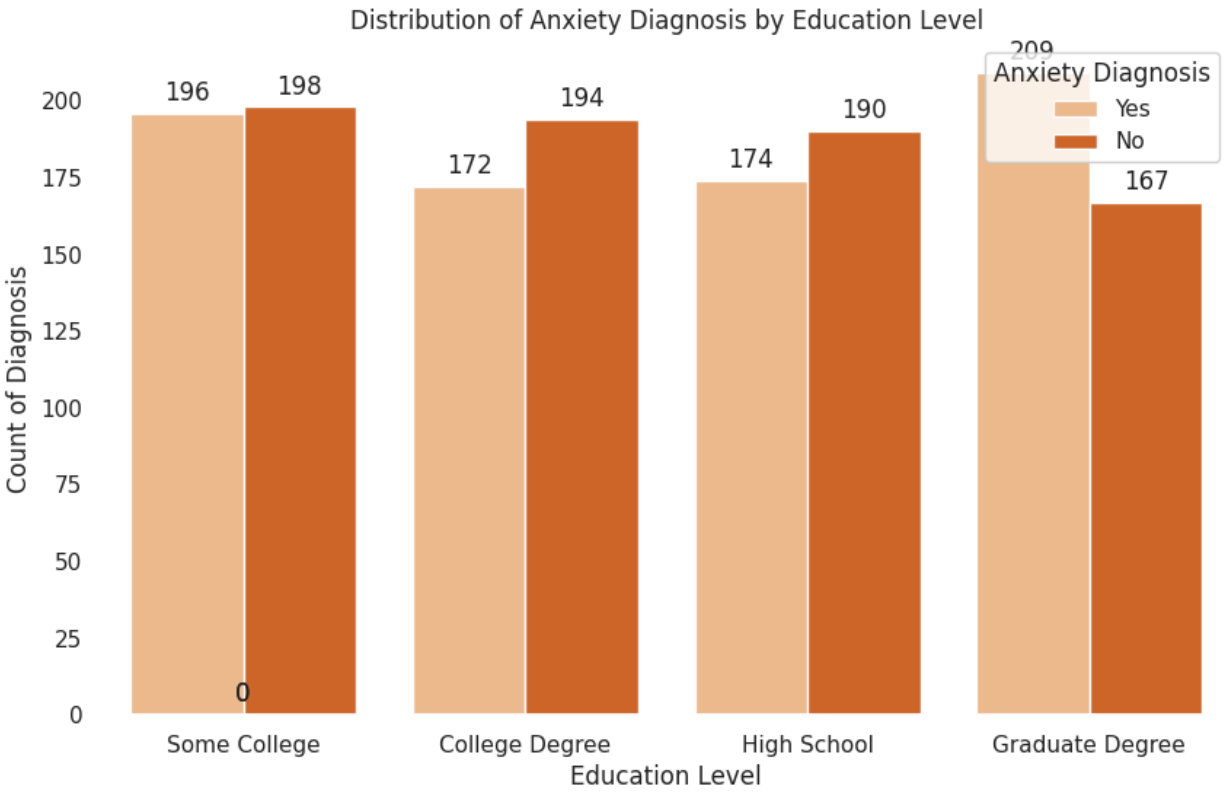


In [26]:

```
# Create the 'Diagnosis' column based on conditions
df['Diagnosis'] = 'None'  # Initialize with 'None'
df.loc[df['Depression Diagnosis'] == 'Yes', 'Diagnosis'] = 'Depression'
df.loc[df['Anxiety Diagnosis'] == 'Yes', 'Diagnosis'] = 'Anxiety'
df.loc[(df['Depression Diagnosis'] == 'Yes') & (df['Anxiety Diagnosis'] == 'Ye

# Create a cross-tabulation table
diagnosis_counts = pd.crosstab(df['Gender'], df['Diagnosis'])
diagnosis_by_gender = pd.crosstab(df['Gender'], df['Diagnosis'], rownames=['Ge

# Create the bar plot using seaborn
plt.figure(figsize=(10, 6))  # Adjust figure size as needed
sns.set(style="whitegrid")
sns.barplot(x=diagnosis_by_gender.index, y=diagnosis_by_gender['Both'], color=
sns.barplot(x=diagnosis_by_gender.index, y=diagnosis_by_gender['Depression'],
sns.barplot(x=diagnosis_by_gender.index, y=diagnosis_by_gender['Anxiety'], col

plt.title('Distribution of Diagnosis by Gender')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.legend()  # Show legend
plt.show()
```



In [75]:
```
# Set the background color
sns.set(rc={'axes.facecolor':'white', 'figure.facecolor':'white'})

# Create the count plot for anxiety diagnosis by education level
plt.figure(figsize=(10, 6))

# **Check the actual column name in your DataFrame**
# **Replace 'Education Level' with the correct column name**
# Assuming the correct column name is 'Education'
plot = sns.countplot(data=df, x='Education Level',hue='Anxiety Diagnosis', pal

# Add a title
plt.title('Distribution of Anxiety Diagnosis by Education Level')

# Add axis titles
plt.xlabel('Education Level')
plt.ylabel('Count of Diagnosis')

# Add data labels
for p in plot.patches:
    plot.annotate(format(p.get_height(), '.0f'),
                  (p.get_x() + p.get_width() / 2., p.get_height()),
                  ha = 'center', va = 'center',
                  xytext = (0, 10),
                  textcoords = 'offset points')


# Display the plot
plt.show()
```


Distribution of Anxiety Diagnosis by Education Level
Anxiety Diagnosis
Yes
No
Count of Diagnosis
200
175
150
125
100
75
50
25
0
196
198
0
172
194
174
190
209
167
Some College
College Degree
High School
Graduate Degree
Education Level